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ABSTRACT

Teachers have far too little scientific training and knowledge to permit them to practice with autonomy. Consequently, teachers are restricted by the imposition of superfluous rules governing students' conduct, behavioral objectives, lesson plans, rigidly scheduled activities and testing programs. If educational practices were based on vast amounts of scientific research and theory, teachers would no longer operate on the bases of common sense and intuition. Arbitrary decisions by school administrators and the schools' vulnerability to political pressures would be reduced. Two questions of fundamental concern to educators are: (1) "How is knowledge acquired?" and (2) "How are moral values learned?" Piagetian constructivist approaches appear to be more adequate than behaviorist approaches to these issues. Teachers who understand children's construction of knowledge can be helped in their training to think about how to define objectives, how to conceptualize principles of teaching, when to suspend those principles, and how to evaluate an activity. Further, constructivist theory and practices can be used to assist children's acquisition of an autonomous morality. Well- prepared teachers in the future should have a firm scientific basis for understanding how children acquire knowledge and become responsible citizens. Otherwise, education will continue to be erratically influenced by changes in political pressures.

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TEACHERS' AUTONOMY AND SCIENTIFIC TRAINING *

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I would like to talk today about the theme of this conference, "1980s--The Future of Child Development," from the standpoint of teachers and the training they receive. Teachers have an enormous influence on children's development, and they can do many things that foster or hinder this development. But teachers today have very little autonomy and scientific training, and I would like to show why I believe they must have much more of both. By autonomy I mean the right and responsibility to make professional decisions. By scientific training, I do not mean training in physics and chemistry. I am referring to the scientific study of children. Teachers today generally base their practice on their common sense and intuition about what "feels right" rather than scientific knowledge of how children develop.

I would like to focus first on how little autonomy teachers have. The most flagrant example is the imposition of behavioral objectives. Behavioral objectives are often enforced with a testing program and/or charts for teachers to record when each specific objective was attained by each child in the room. Many teachers complain that they are so busy testing children and keeping records now that they have less and less time left for teaching. Many are forced to teach trivia and/or things they know children cannot possibly learn. An example of trivia is the ability to look at the picture of a cat and say in complete sentences, "This is a cat. This is not a dog." Examples of things that are too hard are

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missing addends and place value in first-grade arithmetic. A missing addend is "2 + ___ = 5," for example. Place value refers to the ability to know that in "11," for instance, the first "1" means "10," whereas the second "1" means "1." Many teachers have told me that they teach these things just to be able to say to their superiors that they have taught them. If children do not learn these things, they say, they cannot be fired for not having taught these impossible lessons. Some teachers even feel forced to change children's answers on tests, or to make up scores for tests they never gave.

When behavioral objectives and a testing program are imposed, teachers do not have the right to decide what to teach, how to teach, and how to evaluate the outcome. The implication of such imposition is that teachers are too ignorant, dumb, and/or lazy to be allowed to make these decisions. Teachers thus become the mere instrument of other people who are supposed to know. It is true that some teachers are lazy, but we have to ask why they became lazy. School systems discourage initiative and want teachers to be obedient rather than critical and responsible. If teachers are not insulted by behavioral objectives, they should be insulted by them.

Many teachers believe that behavioral objectives are harmful to children's development. They believe that, when the lesson is beyond children's ability, all they can learn is the tricks to produce the right answers to satisfy the adult. Children also acquire mental blocks about arithmetic and a dislike for school and learning when they are forced to do things they cannot understand. In medicine, doctors would not tolerate being coerced into doing things against their conscience.

Even when there are no behavioral objectives, teachers are often made to teach in ways they do not believe. For example, many teachers are made to write lesson plans for the next day or the whole week, even if

they do not believe in these lesson plans. These teachers say that it is impossible to know in advance how children will react to the teacher's suggestion. Many write any old thing that will satisfy their superiors, knowing perfectly well that they will do something else instead. I have seen lesson plans supposedly designed to teach specific gravity, for example, when all that the kindergarten teacher intended was good, old water play. Specific gravity, according to Inhelder and Piaget (1955), cannot be understood before the period of formal operations in adolescence.

Then there is the director of a day care center who insists on having a science corner and math corner in every classroom. Some teachers do not believe in science or math corners because they do not think children learn science by having pine cones and goldfish on a table in the classroom. Math, too, they say, does not come out of counters or geometic shapes in one corner of the room.

What about the imposition of a time for children to go to the Learning Center? The very name "Learning Center" makes many teachers laugh. "Isn't the classroom or home the center of learning for the child?" they ask.

Then there is the rule of having to walk in the hallway, always in a neat line. Some teachers believe that this is unnecessary and even harmful to the child's development of autonomy because neither teachers nor children can understand why they have to walk in a neat line when they are the only ones in a big hallway.

Why Teachers Have Little Autonomy

Why do teachers have so little autonomy? Doctors, lawyers, engineers, architects, accountants, and university professors are much freer than teachers to follow their professional conscience. Part of the explanation can be found in the fact that teachers have to work in institutions. If they were free to work for themselves like doctors and lawyers, teachers

would have to think more for themselves and be responsible for the decisions they made. The institutions teachers work in are, moreover, vulnerable to political pressures. But there is a reason for the very fact that political pressures can be applied to schools. I am referring to the underdeveloped state of knowledge in education. Medicine is based on a vast amount of scientific research and theory. Law is likewise based on a highly explicit and systematized body of knowledge in which attempts are constantly and rigorously made to avoid contradictions. Engineering, too, is based on a vast amount of scientific research and theory. Education, by contrast, is in a prescientific or early scientific stage that resembles Aristotle and Ptolemy's astronomy. Aristotle and Ptolemy rejected the view that the sun might be the center of our system, and upheld the common-sense opinion that the sun and other planets revolved around the earth. Because education does not have a scientific base, educators change their beliefs with the public as the old pendulum swings, and they jump on bandwagons when new fads appear. In education, curriculum decisions are often made at the top of the hierarchy without any scientific scrutiny, and enforced by power, without scientific debate.

Education has developed over the centuries by personal opinions called philosophies and by trial and error and by tradition, to meet certain practical needs. To educate the young generation of their society, teachers have used their best common sense. But a profession cannot develop on the basis of common sense alone. We now have many situations in which one person's common sense is the diametric opposite of another person's common sense, and disagreement ranges from what to teach at what age to everything else, such as lesson plans, the science corner, and the Learning Center. Just as agriculture and medicine advanced with scientific research and theory, education can go forward only by raising fundamental

questions once again and getting scientific answers to these questions. The fundamental questions are: "What is knowledge? And how do children acquire it?" and "What is morality? And how do children become moral?"

Attempts to Apply Scientific Research and Theory

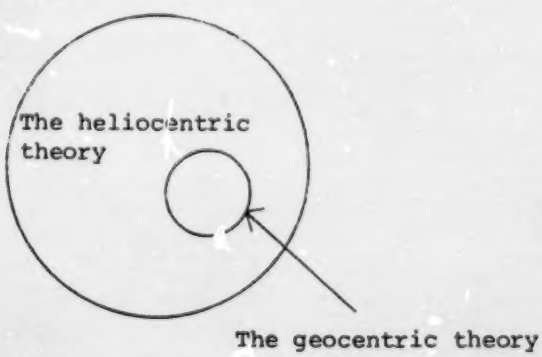
I stated earlier that education is in a prescientific or early stage. The reason for this statement is that some educators have tried to base their practice on various scientific theories such as behaviorism. Essentially, behaviorism views learning as a process of internalization from the environment and explains this "learning" by reinforcement. Its implication for educators is that if we want children to become able to do something, we have to reinforce correct answers with reward and repetition, and sequence the objectives to maximize success.

But there are many counterexamples that make teachers skeptical of behaviorism. For example, if Johnny cries and the teacher holds him, this comforting does not reinforce Johnny's crying. Instead of learning to cry more by having this behavior reinforced, Johnny gets over his upset and goes on to something else that is more interesting than crying. Children's learning to walk and talk also disproves behaviorism. Children do not need reinforcement from adults to learn how to walk and talk, nor do they need a sequence of objectives that maximizes success. Encouragement helps, but if toddlers fall down, they get up and try to walk again even if they are not encouraged by adults. Besides, failure is necessary to learn how to walk. Toddlers need to know how they fall if they are to figure out how to avoid falling. Learning to talk also comes out of children's initiative and errors. No programmer would teach children to say "My foots hurt," "I brang my lunch today," or "I thinked it in my head." But teachers know that children go through these errors. Children make these errors <u>because</u> they are intelligent and can think, and I would

worry about a child who did not make these errors. Some children even surprise us by learning to read, without any teaching or reinforcement on the part of the parents or teachers at the day care center. In my research on first-grade arithmetic, I recently found that, without any teaching or reinforcement on the teacher's part, almost all the children in the class knew by heart the sums of 2+2, 5+5, and 3+3. More than half of the class also knew the sum of 4+4. The children played dice games and card games, and they learned these sums by heart without any lesson, worksheet, drill, or reinforcement.

These examples contradicting behaviorism illustrate the process by which all sciences develop. In astronomy "the" scientific truth before the publication of Copernicus's heliocentric theory in 1543 was Ptolemy's geocentric theory. But many astronomers before Copernicus were bothered by the contradictions presented by the geocentric theory. The calendar of the time was sometimes off, and predictions about planets' positions were constantly wrong. Grappling with these contradictions, Copernicus ended up by proposing a new theory in diametric opposition to the common-sense theory of his day. The scientists of his time reacted by laughing him off the stage. But today, only 400 years later, no one doubts the truth of the heliocentric theory.

The relationship between behaviorism and Piaget's constructivism is analogous to the relationship between the geocentric theory and Copernicus's heliocentric theory. The parallel can be seen in Figure 1. Both behaviorism and the geocentric theory grew out of common sense,



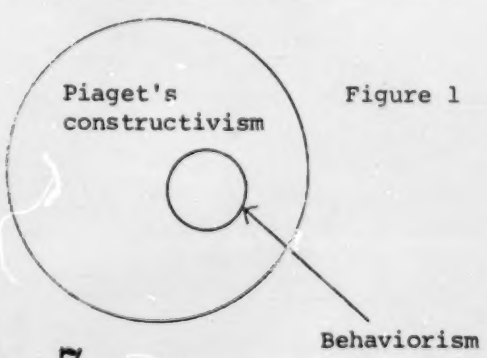


Figure 1

and Piaget and Copernicus both revolutionized common sense. Both men invented their theories by trying to overcome the contradictions presented by the prevailing view. In each domain, the later theory stated the opposite of the earlier theory, but the earlier theory was not eliminated. The earlier theory became a particular case within the new theory. In the weather forecast today, for example, we still hear of the time the sun rises and sets. Within the limited perspective of the earth, it is still true that the sun rises every morning, but from a broader perspective, it is no longer true that the sun goes around the earth. Behaviorism is likewise still true within certain limits. For example, if we want to teach toddlers not to go out into the street, behaviorism is clearly still true and highly useful. If we want to teach children to say "one-two-three-four-five-six" or memorize the multiplication tables, likewise, behaviorism is still as true as the sunrise every morning. But within the broader perspective of children's acquisition of knowledge and moral values, it is no longer true that these are learned by internalization and reinforcement.

Let us return to the two fundamental questions for educators that I stated earlier: "How do children acquire knowledge?" and "How do they learn moral values?" Piaget studied these questions scientifically. He concluded that both knowledge and morality are constructed from within by each child in interaction with the environment, rather than being learned directly by internalization from it.

A few examples might help to understand the child's construction of knowledge. When a friend's 2-year-old got on an airplane for the first time to visit his grandmother, he asked a stranger, as he boarded the plane, "Are you going to visit Granma, too?" Because he was going to

visit his grandmother, the child constructed the knowledge that everybody else getting on the plane was also there to visit his grandmother. When I went to do research in a first-grade class for the first time, to cite another example, the teacher had told the class that my name was Dr. Kamii, and that I was not a medical doctor but one who studied children's arithmetic. The first question I got when I arrived was "Dr. Kamii, what grade are you in?" The child had constructued the knowledge that people went to school if they wanted to study something, and that in school everybody was assigned to a grade.

Once, when I came face to face with a 5-year-old black girl in a day care center, the child greeted me by saying, "Hi, Chinese." I responded by saying that I was Japanese and not Chinese, and asked her "What are you?" The girl said she was black, whereupon I asked "Are you an American?" To my surprise, she said, "yes," and I told her that I, too, was an American. The girl was amazed and asked me, "Is that because you are black?" We see the constructive process in this example again. For this child, all blacks were apparently American, and all Americans were conversely black. When I told her I was an American, she deduced that I had to be black if I was an American. The construction of knowledge is such a complicated business, and anybody who is around children can see that knowledge is not acquired directly by internalization from the environment.

Teachers who understand the constructive process can be helped in their training to think about how to define objectives, how to conceptualize principles of teaching, when to violate these principles, and how to evaluate an activity. This kind of teacher training makes the teacher think on the basis of scientific theory and evidence, thereby

helping her become an autonomous professional. Teachers who can make decisions based on scientific knowledge become like doctors who do not back down under pressure when they believe that Johnny must have surgery.

The second question educators must ask is how moral values are learned by children. Piaget concluded that moral values and rules, too, are constructed from within by each individual, rather than being learned by internalization from the environment. Piaget made a distinction between the morality of autonomy and the morality of heteronomy. Autonomy means "being governed by oneself," while heteronomy means "being governed by somebody else." Piaget asked many children whether it was worse to tell a lie to a grownup or to another child. An example of the morality of heteronomy is the 6-year-old who answered that it was worse to lie to a grownup. When Piaget asked why, the child replied, "Because adults can tell it isn't true." An example of the morality of autonomy is the 12-year-old who answered, "Sometimes you almost have to tell lies to a grownup, but it's rotten to do it to another fellow." Autonomous people have their own conviction about why it is bad to tell lies.

If we want children to become heteronomous adults, the best way is to use behavioristic principles, that is, reward and/or punishment. Behaviorism (the small circle in Figure 1) is a very limited theory that can explain heteronomy and aspects of our behavior that we share with animals, such as certain motor skills and habits. If we want children to become autonomous adults, we need a broader, more powerful theory that goes beyond reward and punishment (the large circle in Figure 1).

Teachers who want to foster the morality of autonomy must think of other ways that encourage children to construct their own moral values for themselves. If a child tells a lie, for example, the teacher must avoid punishing him, look him straight in the eye instead, with great affection

and skepticism, and say, "I really can't believe what you are saying because..." This communication of a point of view makes the child think about what he has to do if he wants to be believed. If there is a good human relationship between the child and the teacher, the child may, over a period of time, construct for himself the value of honesty. Adults who have constructued their own conviction about the desirability of honesty can resist the temptations of the reward system. They become like Elliot Richardson, who was the only one on Nixon's cabinet in the Watergate Coverup Affair who refused to tell lies and handed in his resignation. Autonomy is not only more moral than heteronomy; it is also more intelligent than heteronomy. Autonomy, in other words, is indissociably moral, intellectual, social, and emotional in nature.

Most educators and parents are still at a prescientific stage and hold the common-sense belief that the way to raise children to become moral is by being strict. Many parents blame teachers for not being strict enough, and some even offer to teachers their permission to spank their children. The detention hall, having to write 50 times "I will not talk in class," grades, gold stars, and citizenship awards are all examples of the reward and punishment schools still use to get children to be "good."

The Role of Universities in Teacher Training

I have stated so far that teachers have little autonomy and that education is a profession that does not have a scientific foundation. But who trained these educators? Universities did.

Universities have been guilty of teaching too many methods courses without emphasizing the scientific "why." Many elementary teachers get their certificates with many methods courses and hardly any knowledge of child development. When I ask a teacher, a principal, or a curriculum

specialist why first graders have to learn missing addends and place value, for example, I never get an answer based on scientific knowledge of child development. When I ask what purpose doll play serves, I likewise hardly ever get an answer that goes beyond mere common sense. When I ask whether a Distar language lesson, Montessori sensory exercise, or plain old free play is the most educational, neither teachers nor curriculum specialists can give an answer based on scientific theory. The truth is that few university professors even think about these questions on the basis of scientific research and precise theoretical links. It is no wonder that their students come out of universities completely unable to think about these questions with any degree of scientific rigor.

When theories of child development and learning are taught at universities, they are usually presented one after another in a juxtaposed way, without any integration or relationship to the nitty-gritty of classroom practice. Students are told what Skinner, Lewin, and Gagné said, what Freud and Erikson said, what Gesell and Piaget said, what Guilford and Hunt said, etc., etc., etc., and are not helped to make sense of all that is thrown at them. Many students end up latching on to divergent thinking or something else that emotionally appeals to them, completely unaware of the undesirability of divergent thinking for knowing the sum of 1+2 . Other students end up concluding that all theories are useless because they contradict each other and are irrelevant to classroom practice anyway.

Many university professors believe that teachers must know a little bit about every major theory because, if they are exposed to many theories, they will have the possibility of selecting what they like best. This kind of teaching is intellectual laziness on the professor's part, rather than respect for the academic freedom of future teachers. One theory is

not as good as any other theory, and teachers must be trained to evaluate the scientific rigor, explanatory power, and scope of each theory in relation to the two fundamental questions for educators, namely, "How is knowledge acquired?" and "How are moral values learned?" To tell teachers that they are free to choose theories by personal taste is to deprive them of the scientific training they deserve to get.

Some university professors worship eclecticism, and say that it is best to choose the best from all the theories. But eclecticism is not always a virtue or even a possibility. There can be eclecticism between Erikson's theory and Piaget's, for example, but not between Piaget's theory and behaviorism. As far as the relationship between Piaget's theory and Gesell's findings are concerned, I am not sure that we can speak of eclecticism because I don't think Gesell even had a theory.

	Erikson's theory	Behaviorism	Gesell's findings
Based on scientifically collected data?	No	Yes	Yes
Explanatory?	Yes	Yes	No
Universal?	Not known	Yes	Not known
Contradictory to Piaget's theory?	No (complementary)	Yes	No

Table 1

Table 1 offers a comparison of these three theories, or schools of thought. I selected them because of their diversity, familiarity to educators, and relevance to the two fundamental questions for educators, namely, "How is knowledge acquired?" and "How do children learn moral values?" Personally, I concluded a long time ago that Piaget's theory is the best scientific theory available today with respect to these questions. The bottom line of Table 1 reflects this conclusion. I urge every educator to compare for himself the scientific merits of all the theories in relation to how children acquire knowledge and moral values.

Let me talk first about Erikson's theory. As can be seen in Table 1, his is not a scientifically proven theory if the systematic collection of empirical data is a criterion of a scientific theory. Erikson's theory is based on clinical observation and other observation of people in general. Although he explained cases in different cultures and various points in history, his is not a universal theory, as it has not been confirmed by cross-cultural research. But I find no contradiction between Erikson's theory and Piaget's. Erikson's theory complements Piaget's and fills in the parts about the child's development that Piaget did not study. It helps me as an educator to know about Erikson's stages of "trust," "autonomy (in his terminology)," "initiative," and "industry." As I said earlier, what Piaget called autonomy is indissociably emotional, intellectual, social, and moral.

With respect to behaviorism, however, there can be no eclecticism with Piaget's theory. Behaviorism is a scientific, explanatory, and universal theory that has been confirmed all over the world, especially in research with animals. However, the two theories are in opposition and cannot both be equally true. Behaviorism is true in certain limited areas of human learning, as I said before, but this does not mean that both theories are equally true.

What about the relationship between Gesell's findings and Piaget's theory? Both approaches can be considered scientific in that both collected empirical data systematically. Gesell and his followers, however, only described development and did not explain it (except that they emphasized "maturation," whatever that means). It may help teachers to know that children can copy a cross at age four, but not a square until age five to six (Gesell, et al., 1940). It may also help them to know

about normal motor and social development. From the standpoint of explanation, however, Gesell's findings have nothing to say. For educators, it is the explanation that is important for conceptualizing objectives and principles of teaching. For example, if we know that it is necessary for children to make decisions to develop autonomy, we will know that it is necessary to provide opportunities for them to make decisions.

Describing, classifying, counting, and measuring are what scientists do when they first begin to study a phenomenon. Astronomy, physics, chemistry, and biology, too, started by being on descriptive. Later, however, scientists advance to the stage of explanation. Piaget died without completing the explanation of development, but no science is ever finished once and for all in any event.

If teachers were trained to understand the relationship among the empirical data and interpretations of various theorists, with respect to the question of how children aquire knowledge and moral values, they would not feel so ignorant and helpless under political pressure. If educators understood learning and development scientifically, the profession would go far beyond the present stage of underdevelopment. If teachers understood the parallels among the evolution of psychology from behaviorism to Piaget's theory, the evolution of astronomy from the geocentric to the heliocentric theory, the evolution of physics from Newtonian physics to quantum physics, and the evolution of geometry from Euclidean to non-Euclidean geometry, they would not tolerate for one day the imposition of behavioral objectives or "teacher-proof" programs.

The Direction for the Future

I have insisted so far that education must become more scientific. But I am not saying that education must become a pure science. Education is and must remain an art, just as good medicine still is and must remain an art. Doctors must take into account the possibility of various side

effects, as well as the patient's fears, dependency needs, and need for independence. Medicine is thus an art involving guesswork and human factors, but it is an art based on a vast amount of scientific knowledge. Education must likewise become an art that is based on scientific research and theory.

Science never goes back to an earlier stage. Once we believe in the heliocentric theory, we cannot go back to the old geocentric theory. Once we understand quantum physics, likewise, we cannot go back to the physics of Galileo and Newton. I have seen many behaviorists, associationists, and empiricists change over to Piaget's theory, but I have never heard of a Piagetian who became a behaviorist. When you hear about "back to the basics," therefore, you have to wonder why education has to go back to what did not work before. Science only goes forward and always builds on what is already known.

Education is an incredibly backward, underdeveloped profession, and if teachers do not know what they are doing, it is the state of our knowledge that is to blame. Educators are too willing to continue living in the Dark Ages of magical words like "readiness."

I know that I am being idealistic, and such well-trained teachers cannot be produced in the immediate future. But I think this is the direction in which the profession must move during the coming decade. We must see more rigor in teachers' understanding of how children acquire knowledge and become responsible citizens. Based on a coherent body of empirical knowledge and precise theoretical links, we can begin to clean up the contradictions that are rampant in the field. Whether behavioral objectives are tenable, whether lesson plans are desirable, and whether a science corner is necessary must be decided not on the basis of power or intuition, but on the basis of scientific knowledge. If teachers had as much scientific training as doctors, they may some day have as much autonomy as physicians have. I am not saying that medicine is fully developed or

that doctors always know what they are doing. I am not saying either that there is no controversy in medicine, or that teachers must work as individually as physicians do. What I am saying is that educators have much to learn from the rigor of more advanced professions. Education is much too important to be left behind in such ignorance, ready to be dictated, as it is now, by the swinging of the pendulum and political pressure.

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